STRATEGIC
POLICY
RESEARCH

REGULATORY REFORM FOR THE INFORMATION AGE:

PROVIDING THE VISION

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REGULATORY REFORM FOR THE INFORMATION AGE

Strategic Policy Research

I. INTRODUCTION

In recent years, many regulators have realized that traditional rate-of-return (ROR) regulation is wholly inappropriate for the telecommunications industry. A different approach is needed, as the industry enters the Information Age. Unfortunately, the academic literature on regulation has, until the past few years, provided little guidance on alternatives to ROR regulation.[1] Regulators, therefore, had to invent their plans for regulatory reform *de novo.* Many different approaches were used. For example,

- Nebraska largely deregulated telephone service but allows customers to petition for rate reductions.[2]
- Vermont froze basic residential rates but streamlined regulation of other services.[3]
- Illinois liberalized competitive entry and granted significant pricing flexibility and dealt with subsidy flow issues.[4]

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[1]This fact was observed by Richard Schmalensee, "Good Regulatory Regimes," *RAND Journal of Economics* 20 (Autumn 1989): 417-435. The academic literature did, however, provide substantial documentation of the infirmities of ROR regulation. *See*, for example, H. Averch and L. Johnson, "Behavior of the Firm Under Regulatory Constraint," *American Economic Review*, Vol. 52, December 1962; Ronald R. Braeutigam and John C. Panzar, "Diversification Incentives Under 'Price-Based' and 'Cost-Based' Regulation," Northwestern University, December 1988; Jordan Jay Hillman and Ronald Braeutigam, *Price Level Regulation for Diversified Public Utilities* (Kluwer Academic Publishers: Norwell, Massachusetts), 1989, pp. 9-13; James C. Bonbright, Albert L. Danielsen and David R. Kamerschen, *Principles of Public Utility Rates*, (Public Utilities Reports, Inc.: Arlington, Virginia), March 1988, Chapter 21.

[2]Nebraska Statute 86-801, effective January 1, 1987.

[3]The Vermont Telecommunications Agreement was enacted under PSB Docket No. 5293, order entered December 30, 1988; first extended under PSB Docket No. 5526, order entered December 4, 1991; then extended under PSB Docket No. 5614, order entered January 29, 1993.

[4]Enacted under the Universal Telephone Service Protection Law of 1985, Public Act 84-1063.

- The FCC adopted an extremely elaborate form of price-cap regulation.[5]

We now have several years' experience with regulatory reform in many jurisdictions of the United States, as well as abroad. Results have been generally favorable.[6]

It now seems apparent that incentive regulation has been an appropriate step in the right direction. Further steps in the same direction could yield much larger public benefits. To reap those benefits, regulators must avoid resting on their laurels by simply fine-tuning existing plans. What is called for are bold *new* steps to further regulatory reform.

This paper presents a vision of where regulation should be 5 years from now. The vision provides a compass for evaluating shorter-run reforms. We also suggest some specific short-run reforms that would significantly move regulation in the direction of our long-run vision.

A. Our Vision of Where Regulation Should Be

Rapid technological progress will profoundly affect the telecommunications industry during the next decade. Improvements in fiber-optic systems will lower costs and facilitate the offering of video and data services. These improvements will benefit local exchange carriers, fiber-based competitors, and cable television companies. Digital technology will improve the quality and dramatically expand the capacity of wireless telecommunications.

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[5]Federal Communications Commission (FCC), *In the Matter of Policy and Rules Concerning Rates for Dominant Carriers,* Special Report and Order, CC Docket No. 87-313, adopted September 19, 1990, released October 4, 1990.

[6]For example, R. Schmalensee and J. H. Rohlfs (*Productivity Gains Resulting from Interstate Price Caps for AT&T*, September 3, 1992) estimated that AT&T price caps resulted in $1.8 billion of efficiency gains in the first three years and that 90 percent of the benefits went to consumers. The FCC estimated that the AT&T price-cap plan yielded $1.8 billion to consumers (over four years) [Price Cap Performance Review for AT&T, CC Docket No. 92-134, *Notice of Inquiry,* 7 FCC Rcd 5322 (1992)]. *State Telecommunications Reports* (Vol. 11, No. 4, February 25, 1993) recently estimated that state plans for regulatory reform have yielded $386 million of rate reductions to consumers and $151 million of additional earnings for telephone companies. Alan Mathios and Robert P. Rogers showed that certain long-distance rates were significantly lower in states with pricing flexibility than in those with ROR regulation ["The Impact of Alternative Forms of State Regulation of AT&T on Direct Dial Long Distance Telephone Rates," 20 Rand J.Econ 437 (1989)].

Intelligent-network features will meet an ever wider range of customer needs through flexible routing of calls.

During the next decade, competition in the telephone industry is likely to intensify rapidly. Many business and residential customers will have alternatives to services provided by the local telephone company. The telephone network will evolve into a network of networks.

Not surprisingly, traditional regulatory policies, which evolved during the prior lengthy period of Bell-System (and independent telephone companies) monopoly, will be inappropriate — indeed, destructive — in this new environment. This paper analyzes alternative regulatory policies that will work more effectively. They provide sharper efficiency incentives and avoid the perverse consequences often associated with regulated competition. Our analysis of regulatory alternatives leads to our vision of where regulation should be headed in order to deal effectively with the changes that are to come:

1. In markets where customers have reasonable alternatives to the regulated firm's services, services are deregulated or regulation is streamlined. In those markets, the firm's prices and earnings are not, in practice, regulated. A process is in place for quickly streamlining regulation in additional markets, as competitive alternatives evolve. Within 5 years, many local exchange markets are subject to streamlined regulation or deregulation. Within 10 years, a sizable portion of LEC revenues are subject to streamlined regulation or deregulation.

2. Services not subject to streamlined regulation are governed by price regulation — not traditional ROR regulation. During the term of the plan, the regulated firm's prices are not tied to its earnings. The pricing formula is renegotiated, if necessary, 8 to 10 years in the future.

   The above policies greatly enhance the incentives of regulated firms to operate efficiently. They also stimulate investment in new technology and the offering of innovative new services. At the same time, they reduce both the incentive and opportunity for cross-subsidy.

3. Regulatory policies that promote inefficient pricing have been phased out to the extent possible. Regulators do not attempt to hold long-distance prices artificially high in order to underprice local services. Depreciation policies ensure that the book value of plant approximates its economic value.

Traditional policies to promote inefficient pricing have long outlived their usefulness. They will become increasingly counter-productive, as competition intensifies.

4. Regulated firms have substantial flexibility to set individual prices, subject to a few overall constraints. Price-cap constraints limit the overall level of prices.

   This policy improves efficiency, since the firm understands its costs and demands better than regulators do.

Policymakers must start now to implement these policies over the next few years if the United States is to be well-positioned to lead the world into the Information Age. If policy-makers delay even a few years in getting started — and then face lengthy procedural delays — the required changes will involve substantial dislocations. Unnecessary costs will be incurred, and the nation's technological progress will be retarded.

B. Transitional Issues

A transition may be required to eliminate, to the extent possible, regulatory policies that promote inefficient pricing. A mechanism should be established to avoid encouraging inefficient competitors to enter the market, solely because regulators set prices above costs (in order to underprice other services).

Regulators should phase out inefficient pricing policies which now impede progress. Regulators should also implement mechanisms under which competitors, as well as the incumbent, pay contribution charges to support the remaining inefficient regulatory pricing policies. Admittedly, such mechanisms are inherently difficult to administer effectively and the difficulties increase as competition intensifies. The long-term goal should be to phase out, to the extent possible, the regulatory policies that promote inefficient pricing, so that these mechanisms become unnecessary.

II. ASSESSMENT OF COMPETITION

This section assesses the status and trends of competition facing LECs. The assessment provides essential background for the discussion of regulatory issues in subsequent sections.

LECs already face some competition now. In some areas, competition is quite intense now and in a number of other, areas competition is growing rapidly.[7] During the next 10 years, competition in local exchange markets will likely far outpace the early growth of long-distance competition. Not only are regulatory barriers to entry being removed at Federal and state levels, but regulators are also (unwisely) handicapping LECs by limiting their ability to respond to competition.[8] Federal legislation preempting state regulation of competitive entry (*e.g.*, the Inouye-Danforth bill) would further stimulate the growth of competition.

The primary competitors to LECs in the near future will be competing access providers (CAPs), cable companies, wireless carriers, and interexchange carriers.[9] This section discusses the current status and growth potential of each of these forms of competition.

A. Competing Access Providers

CAPs bypass the traditional LECs by connecting privately-operated facilities directly to long-distance carriers. They generally target the larger customers in concentrated areas,

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[7]For example, according to a recent NYNEX filing, there are currently 18 carriers certified to compete with NYNEX-New York for the provision of local service. *See* NYNEX Universal Service Preservation Plan, filed with the FCC, December 15, 1993.

[8]A good example is the FCC's prohibiting LECs from offering volume and term discounts until competitors reach a certain size (Federal Communications Commission, *Second Report and Order and Third Notice of Proposed Rulemaking, In the Matter of Expanded Interconnection with Local Telephone Company Facilities, Amendment of Part 36 of the Commission's Rules and Establishment of a Joint Board*, CC Docket No. 91-141, Transport Phase I and CC Docket No. 80-286, 8 FCC Rcd 7374, adopted August 3, 1993, released September 2, 1993, ¶118).

[9]LECs face additional potential competition from other sources. For example, power companies have already installed large amounts of fiber-optic cable and could use that cable to compete with LECs. Large users (*e.g.*, state governments) can provide many local telecommunications services for themselves.

such as densely-populated metropolitan areas, which will provide the most traffic and a higher return on network investment. Recent surveys indicate that 62 percent of larger business customers use CAPs for at least some access service.[10] CAPs also offer private line and specialized services, such as videoconferencing and network monitoring.

Although a fairly recent development, the CAP industry has been expanding its networks and laying new fiber very rapidly. A year ago, CAPs already were providing alternative access service in about 50 major metropolitan areas.[11] In addition to the large CAPs such as Metropolitan Fiber System (MFS) and Teleport, a number of cable firms are entering the local exchange market through subsidiary entities operating as CAPs.[12] LECs themselves are poised to compete with each other, as evidenced by the recent spate of proposed mergers and other joint arrangements between LECs and cable companies; *e.g.*, Bell Atlantic-Tele-Communications Inc. (TCI), Southwestern Bell-Cox and U S West-Time Warner.

CAPs currently primarily provide special access and private line services. New mandatory interconnection rules, by affording access to LEC facilities, will help CAPs expand into the switched access and local service markets. The FCC recently adopted rules on expanded interconnection for switched transport services.[13] These rules resemble those previously adopted for special access services. The rules require LECs to allow third parties to interconnect their transport facilities at LEC central offices, serving wire centers, tandem switches and certain "remote nodes." Competing local service providers are to be offered interconnect facilities to a LEC central office on the same terms as the LEC itself. They are also to be offered LEC switching functions on an unbundled basis. A competitor will thereby

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[10]Pacific Telesis *ex parte*, Docket Numbers 91-141 and 91-213 (FCC Apr. 29, 1992).

[11]J. Kraushaar, FCC Industry Analysis Division, "Fiber Deployment Update End of Year 1992."

[12]Cable ownership of CAPs is discussed further in the next subsection.

[13]FCC, *Second Report and Order and Third Notice of Proposed Rulemaking, In the Matter of Expanded Interconnection with Local Telephone Company Facilities, Amendment of Part 36 of the Commission's Rules and Establishment of a Joint Board*, CC Docket No. 91-141, Transport Phase I and CC Docket No. 80-286, adopted August 3, 1993, released September 2, 1993.

be able to combine its facilities and services with those of the LEC. It can then offer switched access and local exchange service.[14]

Interexchange carriers can also collocate and provide transport for themselves. Indeed, any sizable interexchange carriers could economically do so if it found the LEC's price to be excessive or the LEC's service to be unsatisfactory. In this regard, MCI recently announced its intention to enter the access markets as a CAP. The subsequent decline in prices of common stocks in LEC holding companies attests to the seriousness of this competitive threat.[15] In general, buyers wield significant countervailing power in the transport market.

B. Cable

Cable has an ever-growing presence in the residential market. Currently, over 95 percent of television households are passed by cable. The cable penetration rate has grown from 46 percent in 1985 to over 60 percent currently. Subscribers now total 58 million households, and that number is expected to grow substantially in the next decade.[16]

Although traditionally providers of one-way video services, cable firms are already preparing their networks to provide telephone service to residents. Installation of fiber, in addition to improving cable service, provides additional transmission capacity to allow cable companies to provide competing switched access and local exchange service at low incremental cost. Cable is replacing traditional network configurations with "star" configurations that use fiber to connect cable head-ends to a neighborhood node.[17] Such configurations, by limiting the traffic coming into each node, are more readily adaptable to interactive applications. The feasibility of interactive cable is proven with operation in many U.S. test markets, as well as in Canada and the United Kingdom. Cable firms may compete either by providing

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[14]Some states have gone even farther than the FCC. For example, the New York Public Service Commission has afforded LEC status to CAPs.

[15]Jonathan Weber and Leslie Helm, "MCI Vows to Fight for Local Phone Business," *Los Angeles Times*, January 5, 1994, p. 1A.

[16]Based on figures provided by the National Cable Television Association (NCTA). Current subscribership figure reflects July 1993.

[17]G. Gilder, "Cable's Secret Weapon," *Forbes*, April 13, 1992, pp. 80-81.

local-exchange service directly or by leasing distribution facilities to other local service providers.

The proposed merger between Bell Atlantic-TCI and the joint arrangements between Southwestern Bell-Cox and U S West-Time Warner attest to the synergy between the cable and local-exchange industries.[18] The above firms envision that cable systems will provide switched video services (video on demand), as well as telephone services, outside the LEC's serving area. In addition, Bell Atlantic recently obtained court permission to provide cable service inside its serving area.

Even before the above-cited merger and joint arrangements, cable firms evidenced interest in the local exchange market. TCI has announced plans to spend $1.9 billion to build fiber optic hubs that will link its cable television systems and to deploy fiber optics from the headend to the neighborhood level.[19] First Pacific Networks, Inc. announced the FPN1000 Cable Telephone System this June. This system will allow cable network operators to deliver switched voice to the home over existing cable plant.[20] Time Warner agreed to test FPN's digital system, which would provide alternative access over Time Warner's Queens, New York cable system. In June, Time Warner Inc.'s cable television unit said it was seeking regulatory approval to offer telecommunications services in San Diego.[21]

Cable, which reaches residential customers, and CAPs, which reach business customers, are realizing a synergy through corporate integration and network alliances. In fact, cable interests currently control over half of CAP revenues.[22] The FCC has ruled that

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[18]Partners in the Bell Atlantic-TCI deal characterize the proposed merger as a "'procompetitive' combination that could let TCI offer telephone service in competition with other Baby Bells" [*The Wall Street Journal,* October 14, 1993, p. A7 (column 1)].

[19]"TCI Launches Four-Year, $1.9 Billion Fiber Deployment Plan," *Telecommunications Reports* (April 19, 1993), p.4.

[20]"FPN1000 Delivers Cost-Effective Telephony over Cable," press release from First Pacific Networks, June 7, 1991.

[21]"Time Warner, Baby Bell May Compete in San Diego," *The Wall Street Journal,* June 24, 1993, p. B7.

[22]See Peter W. Huber, Michael K. Kellogg and John Thorne, *The Geodesic Network II: 1993 Report on Competition in the Telephone Industry* (Washington, D.C.: The Geodesic Company, 1992), pp. 2.60-2.61. TCI and Cox hold interests in Teleport, Adelphia Cable in Hyperion Telecommunications, American Cablevision in Hyperion Telecommunications, and Time Warner in Fibernet, Inc. Jones Intercable is a sister company of Jones Lightwave.

cable company ownership of CAPs does not violate the cross-ownership ban because of the nondominance of CAPs.[23] Cable companies have also evidenced active interest in wireless service, as discussed in the next subsection.

C. Wireless Competition

The wireless communications industry has burgeoned in recent years. Cellular service was originally provided via mobile phones, installed in cars. Mobile phones are still widely used, but customers are increasingly using small handheld portable phones. With portable phones, users can make or receive calls anywhere — so long as cellular service is available in the area.

Use of cellular has increased dramatically in recent years, with a 46 percent increase in 1992 alone.[24] Deployment of digital technology will improve transmission quality and allow cellular systems to carry many times the calls that they can carry today. This will lower unit costs and alleviate the capacity constraints that have hindered cellular's ability to compete with LECs. Cellular may provide switched access and local exchange service in combination with cable; TCI is reported to be conducting joint trials of combined cable and cellular service with McCaw Cellular.

On September 23, 1993, the FCC made an historic decision, allocating 160 MHz to personal communications systems (PCS). This allocation represents roughly a four-fold increase in the spectrum available for wireless telephony.

The regulatory process to distribute the spectrum to providers of PCS is well advanced. It is moving ahead on an expedited schedule, mandated by Congress. It now appears that PCS may actually be deployed by 1996, or even earlier.

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[23]Approving the transfer of microwave licenses necessary for Cox Cable's acquisition of 50.1 percent of Teleport's shares, the FCC ruled 5-0 that cable television companies are permitted to provide telephone services. "FCC Finds Transfer of Three Microwave Radio Stations from Merrill Lynch Group to Cox Teleport Consistent with Telco-Cable Cross-Ownership Rules, *FCC News*, August 5, 1992 (CC-463).

[24]"Cellular Industry Sees 46% Subscriber Increase in 1992," *Telecommunications Reports* (March 8, 1993), p. 24.

The vast increase in capacity of wireless telephony (both from deployment of digital technology and from PCS) is sure to drive down prices. Cost reductions will lead to further price declines. As a result, the already rapid growth of wireless telecommunications will accelerate. Within a few years after the deployment of PCS, we expect that a large fraction of U.S. households and businesses will use wireless services for part of their telecommunications needs. Wireless telecommunications will become an ever more important part of the nation's telecommunications infrastructure.

Cellular will face some additional competition, even before PCS is deployed; *e.g.*, through use of specialized mobile radio service (SMRS) spectrum.[25] Consequently, the softening of cellular prices and the resultant acceleration of growth of wireless services may begin even before 1996. PCS will, like cellular, be targeted at customers who value portability. However, as prices of wireless services decline, the premium that must be paid for portability will probably be much lower than today. When that happens, wireless telephony will provide substantial competition to landline LECs. If LECs charge too much for wireline services or provide poor service, customers will be able to switch to wireless telephony.

Providers of wireless service can easily connect directly to interexchange carriers and bypass the LEC. Consequently, LECs will progressively lose access revenues, as the wireless industry grows during the next decade. Indeed, as prices of wireless service fall, the profits from bypass will be an increasingly important source of funds for the wireless industry. AT&T's recent acquisition of McCaw and MCI's apparent interest in obtaining a national PCS license attest to the nexus between cellular service and long-distance service.

Wireless service can also be used to supplement wireline services provided by CAPs. Cable companies and local fiber-based CAPs can provide telephone service at low marginal cost, where their networks are in place. They can use wireless technology to expand their area of coverage and to accommodate customers who value portability. Cable companies are actively pursuing this concept, in addition to acquiring fiber-based CAPs. Indeed, cable

[25]Recent transactions (*e.g.*, between Motorola and Nextel) facilitate the efficient repackaging of SMRS spectrum so as to be more competitive with cellular.

operators have conducted more PCS trials to date than any other segment of the telecommunications industry.

D. Summary of Status/Trends in Local Exchange Competition

CAPs are well-funded. They already have a presence in most of the major markets. They have already established business relations with most of the largest corporations. Their networks are operational and provide service over state-of-the-art fiber networks. Regulators (unwisely) handicap their primary competitors, the LECs. It is hard to describe a more promising growth scenario for an industry.

Cable companies today pass over 95 percent of U.S. television homes and serve over 60 percent of households.[26] The economics of their own industry is driving cable companies to install fiber optics, which can then be used to compete with LECs at low incremental cost. Furthermore, the cable industry, despite regulatory initiatives to limit monopoly rents, continues to generate huge amounts of cash. The industry has already begun to use some of that cash to invest in competing with local exchange carriers and will undoubtedly continue to do so throughout the 1990s. The Bell Atlantic-TCI merger and the joint arrangements between Southwestern Bell-Cox and U S West-Time Warner are likely to further this trend.

Cellular telephony has the advantage of portability. Its cost is high today because of limited availability of spectrum. In September 1993, however, the FCC took the historic step of increasing the spectrum available for wireless telephony fourfold. The increased spectrum is likely to increase the supply of wireless telephony and substantially drive down its price. When this happens wireless telephony will be able to compete head-to-head with LEC landline services.

Local services competitors are much better poised for rapid growth than were early[27] long-distance competitors. Transmission quality of the latter was degraded, since competitors

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[26]Figures provided by the NCTA.

[27]This discussion considers the competitive situation in long distance in the late 1970s after the *Execunet* decisions. *See* Re MCI Telecommunications Corp., 60 FCC 2d 25 (1976), reversed by the Court in 561 F2d 365 (D.C. Cir. 1977) *(Execunet I)* and Re American Teleph. & Teleg. Co. Petition for Declaratory Relief, 67 FCC 2d 1455 (1978), reversed 580 F2d 590 (D.C. Cir. 1978) *(Execunet II)*.

had to use additional analog facilities. Small customers had to dial many additional digits to make calls. WATS resale was not yet mandated; so competitors could not profitably offer universal termination of calls. Because of these handicaps, early long-distance competition developed a reputation for poor quality — a reputation that persisted many years.

Local-services competitors will apparently have none of these handicaps. Furthermore, customers are much more accustomed to using telecommunications competitors than they were in the 1970s. For these reasons, it is likely that local-services competition, especially competition for long-distance access, will grow far more rapidly than early long-distance competition.

These unprecedented changes are profoundly affecting the structure of the telecommunications industry. Within 10 years, many business and residential customers will have alternatives to the local telephone company. Fiber-based competitors (CAPs and cable companies) will offer broadband video and data services, in addition to voice communications. As prices of wireless services decline, their usage will become pervasive. The telephone network will evolve into a network of networks.

E. Implications for Regulation

Plans for regulatory reform are inherently long-term in nature. They should be designed to deal with developments that are likely to occur over the next 5 to 10 years. This section clearly demonstrates that rapid growth of competition is such a development. Plans for regulatory reform should anticipate the growth of competition. It should allow rapid and appropriate regulatory responses as competition in particular markets intensifies.

Indeed, appropriate long-run regulatory policies should be in place *before* competition becomes ubiquitous. Otherwise, the required changes may cause dislocations to competitors (who entered under the old policies) and their customers. Given the lengthy procedural delays always associated with regulatory change, the need to start the process of reforming regulation is urgent.

The trap to avoid is basing regulatory decisions on the extent of competition that exists today. Any policy established on that basis is likely to be unworkable within a few

years. Good public policies should be workable now and also be workable — without extensive fixes — when competition becomes much more intense.

III. EFFICIENCY INCENTIVES

ROR regulation has traditionally been used to regulate local exchange carriers. Such regulation reduces certain kinds of risks, but it significantly dulls incentives for efficiency. This section discusses both ROR regulation and some alternatives that can sharpen incentives and thereby improve productivity.

A. ROR Regulation

Traditional ROR regulation was practiced by the FCC before the AT&T divestiture, and continues to be practiced in several states. Under the traditional form of ROR regulation, carriers may petition the regulatory commission for rate increases if they believe that they cannot earn a "fair" return under existing rates.[28] The commission also may initiate a rate case if it believes that the company's earnings are excessive. In either case, a regulatory proceeding is initiated under which rates are supposed to be set to allow the company to earn a fair return. After rates are set in a regulatory proceeding, they remain in place until the next proceeding. Depending on numerous conditions, the next rate case may be the following year or several years later. In any event, traditional ROR regulation embodies a lag between the time that costs change and the time that rates change to reflect the change in costs. The regulatory lag is variable.

After the AT&T divestiture, the FCC established revised ROR procedures, under which interstate rate proceedings were conducted approximately once a year for both AT&T and the LECs. The Commission adopted policies that substantially reduced the per-minute costs of interstate services and cost reductions were passed on to consumers in regulatory rate

[28]Although there is no specific mathematical formula for determination of "fair and reasonable" return, two Supreme Court cases guide that determination. *Bluefield Water Works & Improvement Co. v. Public Service Commission of West Virginia* (262 U.S. 679, 1923) sets the reasonable rate standard as one permitting ". . . a return on the value of the property . . . equal to that generally being made at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties . . . ." *Federal Power Commission v. Hope Natural Gas Company* (320 U.S. 391, 1944) reemphasized the *Bluefield* statements, but recognized that revenues must also cover capital costs. Later Supreme Court cases have reiterated the criteria set forth in *Hope*.

proceedings.[29] Annual proceedings were called for in order to expedite the flow-through of savings to consumers. Under these procedures, the *effective* regulatory lag is approximately one year — considerably shorter than under traditional ROR regulation where the effective lag was more variable.[30]

With regulatory lag, cost changes are not immediately passed on to customers. Hence, the company retains some incentive to improve efficiency. (*We use the term "efficiency" broadly in this study to include reducing costs, offering profitable new services, and being appropriately responsive to customer needs.*) In particular, the company gets to keep the fruits of efficiency gains until the next rate proceeding.

Nevertheless, the incentives to improve efficiency are substantially diluted, compared to those in unregulated industries. For example, if an unregulated competitive firm makes long-lasting efficiency gains, it enjoys benefits (in the form of higher profits) as long as the gains persist.[31] On the other hand, a regulated firm enjoys higher profits only until the next rate proceeding. Productivity gains are thereby shared between the regulated company and its customers.

The dilution of incentives would make no difference if efficiency gains could be achieved effortlessly. Unfortunately, that is rarely the case. Efficiency gains generally involve changing established ways of doing business and the frustrating process of learning how to operate efficiently under the new conditions. Workers incur personal costs, as they may have to be retrained, relocated or laid off. Firms, whether regulated or not, are disinclined to take such actions unless the financial rewards are substantial.[32] With ROR regulation, the rewards are often not substantial enough to induce the efficiency gains.

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[29]The Commission established a federal Subscriber Line Charge (SLC) that recovered a portion of nontraffic-sensitive (NTS) costs on a per-line basis rather than on the basis of minutes of use. Also, substantial costs were shifted from the interstate jurisdiction to state jurisdictions.

[30]Many states undertake frequent periodic reviews, but reset rates less frequently.

[31]This issue is discussed further in the next subsection.

[32]This trade-off is explicitly modeled by R. Schmalensee, *op. cit.* and J. J. Laffont & J. Tirole, "Using Cost Observations to Regulate Firms," 94 *Journal of Political Economics* 614 (1986).

In this regard, ROR regulation resembles cost-plus procurement.[33] Under such procurement, the supplier bears *some* cost if there are sizable overruns; namely, customer dissatisfaction and reduced prospects for future sales. However, these penalties are much less severe than having to absorb the entire cost overrun. Consequently, suppliers under cost-plus contracts do not expend sufficient effort to reduce costs, and large cost overruns are commonplace.

B. Measurement of Efficiency Incentives

We can measure the efficiency incentives provided by alternative regulatory plans. We simply calculate the fraction of gains that the firm gets to keep if it improves efficiency.

In a purely competitive market, the market price does not depend significantly on the behavior of the firm (or of any other single firm). In particular, the price is independent of the firm's costs; it depends only on the costs of the firm's competitors.

Consequently, if the firm lowers its costs, the market price does not change. Furthermore, in a purely competitive market, the firm can sell its entire output at the market price. It therefore has no incentive to lower prices because its costs are reduced. The end result is that all cost savings flow directly to the firm's bottom line.[34]

It follows that unregulated competitive firms have maximal incentives to improve efficiency. Firms subject to cost-plus regulation, with no regulatory lag, get to retain zero percent of any efficiency gains; they have no incentive whatever to improve efficiency. Most actual regulatory plans fall somewhere in between these two extremes.

The mechanics of measuring incentives are discussed in the Appendix. Our proposed measure naturally depends on the specifics of the regulatory plan. It also depends on three

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[33]*See* William E. Kovacic, "Commitment in Regulation: Defense Contracting and Extensions to Price Caps," *Journal of Regulatory Economics*; 3:219-240 (1991), Kluwer Academic Publishers, Boston.

[34]Consumers benefit as all firms respond to those incentives to improve efficiency, and the market price declines. However, each firm still retains full efficiency incentives. If a firm makes greater efficiency gains than other firms, its profits increase; if it makes lesser efficiency gains than other firms, its profits decline.

Consumers benefit further if the efficiency gain involves product innovation. In that case, infra-marginal consumers enjoy additional consumer surplus.

Since taxes must be paid under all regulatory scenarios, we reasonably disregard them in this analysis.

parameters: the duration of efficiency gains, the discount rate and the growth rate. Assumed values for the parameters are stated and justified in the Appendix.

According to this measure, the incentives embodied in ROR regulation, as practiced by the FCC with a one-year lag, afford only about 14 percent of the efficiency incentives that exist in unregulated competitive markets. Thus, that mode of regulation differs only slightly from pure cost-plus regulation. It actually provides only a small fraction of the efficiency incentives supplied in unregulated competitive markets.[35]

C. Incentive Regulation

Most incentive-regulation plans are hybrids between direct price regulation and ROR regulation. The term of the plan is typically 3 to 5 years. The aggregate price level is limited by a price freeze or formula that is set in advance.[36] The allowable price level changes each year in accordance with the formula. However, the formula itself does not change during the term of the plan. There is often an additional sharing mechanism by which prices are adjusted downward if the firm's earnings are high and adjusted upward if earnings are low.[37]

In this section, we focus initially on pure price regulation, with no sharing mechanism. Sharing mechanisms are discussed at the end of the section.

1. Pure Price Regulation

Under price regulation, the pricing formula is generally designed to yield lower rates than expected under ROR regulation. The FCC denoted these expected savings as the

[35]Efficiency incentives are even lower if regulators do not fully take into account the fact that some efficiency gains are transitory. See Appendix for further discussion of this issue.

[36]This does *not* apply to services subject to streamlined regulation, as discussed below.

[37]Two notable exceptions are the AT&T and BT price-cap plans. Those plans contain no sharing mechanism.

"Consumer Dividend."[38] Regulators may also try to get more for customers by negotiating favorable terms at the end of the term of the price-regulation plan.

The Consumer Dividend does not in any way dull (marginal) efficiency incentives. The firm commits to adjust prices in accordance with a productivity commitment (including the Consumer Dividend) that is fixed in advance and does not depend on its *actual* efficiency gains. Thus, any incremental gains or losses in economic efficiency relative to the productivity commitment flow directly to the firm's bottom line. Since incentives remain fully intact, the Consumer Dividend does not reduce the efficiency gains that can be expected, once the company is operating under price caps.

However, if regulators elect to establish a Consumer Dividend and set it too high, the entire plan for regulatory reform may fall through. Price regulation is unlikely to work well in practice unless the regulated firm, as well as the regulator, agrees to the plan. Otherwise, the firm could rely on getting regulatory relief, as provided for by the *Hope* decision,[39] if its earnings fall below the cost of capital. Under these circumstances, the usual efficiency incentives of price regulation would be absent. In order to avoid this result, any Consumer Dividend must be set at a level which benefits the company, as well as customers. Since the efficiency gains from incentive regulation can be large, there will probably be a wide range of Consumer Dividends that benefit both the company and customers.

On the other hand, renegotiating the price-cap plan at the end of each term does dull incentives.[40] Suppose that the firm improves efficiency during the price-cap period. Many of the efficiency gains will be long-lasting and persist after the end of the price-cap period. If rates are lowered at the end of the price-cap term, the firm derives no profit from the continuing benefits of its efficiency gains.

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[38]The Consumer Dividend is over and above the productivity gains that would be expected under continued ROR regulation. The productivity offset in the FCC price-cap plan is the sum of the expected productivity gains under ROR regulation and the Consumer Dividend.

[39]*FPC v. Hope Natural Gas Co., op. cit.*

[40]This effect is noted in Paul R. Joskow and Richard Schmalensee, "Incentive Regulation for Electric Utilities," *Yale Journal on Regulation*, Vol. 4, No. 1, Fall 1986, p. 25.

The prospect of rate reductions when the price-cap plan is renegotiated reduces efficiency incentives from the start. The firm is less inclined to improve efficiency in the first place. Less efficiency gain can be expected, the more frequently the plan is renegotiated. The deployment of new technology and the pace of innovation are key sources of efficiency gains that are substantially retarded when the firm cannot expect the benefits to be sustained. If the regulated carrier is to be encouraged to make profound, systemic changes, then efficiency incentives must be sustained over a period of time long enough to be reflected in capital deployment decisions and fundamental marketing decisions that give rise to efficiencies.

Efficiency incentives are maximized with indefinite-term price caps, under which the pricing formula is specified in advance and never changes. Under price caps with an indefinite term, the firm may make a productivity commitment, including a Consumer Dividend. However, the firm loses none of the benefits of its *incremental* gains (relative to the productivity commitment) through regulatory repricing. It also bears the full brunt of any losses in productivity. The (marginal) efficiency incentives, therefore, are the same as in unregulated competitive markets. Because efficiency incentives are so great, the Consumer Dividend under indefinite-term price caps can be larger than under short-term price-cap plans.

Long-term price caps may be impractical in the absence of additional safeguards. The price-cap formula must be set, while the future is not known with certainty. Indeed, with the rapid advance of technology and growth of competition in the telecommunications industry, the future is *very* uncertain. Consequently, the price-cap formula may become inappropriate after an extended period of time. However, the evolution of vigorous competition will provide an important safeguard to correct for errors in the establishment of the price-cap mechanism. As in the case of AT&T's price-cap plan, competition can be expected to ultimately become the predominant form of discipline for prices, replacing price caps over time. Thus, the risk of a longer-term price-cap plan is reduced by the growth of competition.

Albeit that indefinite-term price caps may involve excessive risk, price-cap plans with terms longer than 3 to 5 years should be seriously considered. Table 1 shows the amount of efficiency incentives provided by pure price-regulation plans with terms from 1 year to 10

years.[41] With a term of one year, price caps are identical to the FCC's variant of ROR regulation. Under either regime, the firm gets to retain the benefits of its efficiency gains for only one year. Consequently, efficiency incentives are about 14 percent, the same as before. With longer terms, the efficiency incentives increase. They are about 35 percent for a 4-year term and about 71 percent for a 10-year term.

In choosing among these pure price-cap plans, the significantly greater efficiency incentives of long-term plans must be traded off against the greater risk. The academic literature provides some guidance in making this trade-off. Richard Schmalensee, in his paper "Good Regulatory Regimes," examined the trade-off between risk and efficiency incentives in price-cap plans. He concluded that for a range of plausible parameter values, efficiency incentives are (on average) optimized at approximately the 63 percent level.[42] Below 63 percent, incentives may be inadequate and yield too low a level of efficiency. Above 63 percent, the risk may be excessive; *i.e.,* the expected losses from misspecifying the productivity commitment (too high or too low) may outweigh the incremental efficiency gains from sharper incentives. Schmalensee's analysis suggests that regulators should not adjust the pricing formula until 8 to 10 years in the future.[43]

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[41]See Appendix for discussion of the methods used to measure incentives.

[42]Schmalensee's paper does not explicitly address the term of the price-cap plan, but it does focus on the trade-off between risk and efficiency incentives.

The cited result applies to the case in which the regulator maximizes consumer benefit subject to allowing the firm to have non-negative expected profits (over and above its cost of capital). Higher efficiency incentives (86 percent) would be optimal if the regulator sought to maximize overall economic welfare, including the firm's profits as well as consumer benefits.

[43]Prices would, however, be adjusted each year in accordance with the original formula. Other adjustments may also be appropriate on an ongoing basis. For example, we recommend annual reviews to streamline regulation of additional services and remove services from regulation, as competition evolves.

Table 1 Efficient Incentives Under Pure Price Caps (No Earnings Sharing)	
Term of Plan	Efficiency Incentives Relative to Unregulated Markets
(Years)	(Percent)
1	14
2	21
3	29
4	35
5	42
6	49
7	55
8	62
9	67
10	71

It appears from the Schmalensee analysis that regulators have been excessively cautious in reviewing the pricing formulae after 3 to 5 years. Reviewing the pricing formulae less frequently could greatly increase efficiency incentives and would allow the consumer dividend to be higher.

2. Sharing Mechanisms

Regulators have further dulled the efficiency incentives under price caps by having additional "sharing" mechanisms incorporated into their price-cap plans.[44] Under sharing mechanisms, the firm gets to keep only a fraction of efficiency gains — even during the initial price-cap period. The higher the sharing percentages, the less are the efficiency incentives and the less are the efficiency gains. Sharing is inherently counter-productive when the term of the price-cap plan is too short, and incentives are too diluted to start with — as is the case with all existing price-cap plans.[45] This applies, in particular, to the FCC's price-cap plan for LECs. The FCC plan is thus a hybrid between pure price caps and ROR regulation.

Table 2 shows the marginal efficiency incentives under price regulation with 50/50 sharing of earnings. The table applies only to firms whose earnings are in the sharing range. Under the FCC hybrid price-cap plan for LECs, 50/50 sharing occurs if the LEC's earnings are between 12.25 and 16.25 percent per year.[46]

As the table shows, a 4-year hybrid price regulation plan with 50/50 sharing has approximately 18 percent of the efficiency incentives provided in unregulated competitive markets. These incentives only slightly exceed those under 1-year ROR regulation.

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[44]For example, under the LEC price-cap plan, LECs choosing a 3.3 percent productivity offset must share with their customers 50 percent of earnings between 12.25 percent and 16.25 percent, and 100 percent of earnings above the 16.25 percent level. Under the California plan, earnings above a benchmark rate of return, set 150 basis points above the expected rate of return, are shared equally between shareholders and ratepayers. In Kentucky, there is 50/50 sharing on return on capital between 11.61 and 13.11 percent. Above 13.11 percent, South Central Bell retains 25 percent and returns 75 percent to ratepayers.

[45]More generally, sharing plans have all the same infirmities as ROR regulation (see footnote 1), but to a lesser degree.

[46]If LECs elect to lower prices further to a level reflecting a higher 4.3 percent productivity offset, they may retain 50 percent of the earnings between 13.25 and 17.25 percent.